ELECTRICAL EQUIPMENT NOTE: Both Auto-Lite and Delco-Remy electrical equipment are used.

MODEL IDENTIFICATION

SERIAL NUMBER: On left side of cowl (use Eng. No.).

ENGINE NUMBER: Stamped on upper left side of cylinder block between #3 and #4 cylinders.

►**1949 Numbers "2200-9" Series**—Continuation of 1948 numbers—1948 starting numbers: Eight—G-200001 Up, Super Eight—G-400001 Up.

►**1949 Numbers "2300" Series**—(Eight) H-200001 and Up, (Super Eight) H-400001 and Up.

►***ENGINE NUMBER CODE: Marks* following *no. indicate:***
★—Engine Bore. .020" Oversize.

TUNE-UP

COMPRESSION PRESSURE: 120 lbs. at cranking spd.

VACUUM READING: Steady 18-20" idling at 6 MPH.

FIRING ORDER: 1-6-2-5-8-3-7-4. See diagram.

SPARK PLUG GAP: .028", Limits .025-.030".
Plug Types—Auto-Lite P-4, AC No. 104, or Champion Y4A. 10 mm. Metric.

DISTRIBUTOR: Breaker Gap—.017". Limits .013-.018".
Cam Angle—(Auto-Lite)—Closed 27°, Open 18°.
Cam Angle—(Delco-Remy)—21-30° with .017" gap.
Breaker Arm Spring Tension—17-20 ounces.
Automatic & Vacuum Advance—*See Ignition.*
Condenser Capacity—.20-.25 microfarad.

IGNITION TIMING: 6° BTDC.
Timing Procedure—*See Ignition Timing.*
Vibration Dampener Mark—"#1UP.DC" with fifteen 1° graduations ahead of this point. Set ignition contacts to open at 6th graduation before "DC"
Fuel Compensator Setting—Slight ping accelerating with wide open throttle.

CARBURETION:
Idle Setting—(Eight—WDO) ⅝-1⅛ turns open, (8—WGD) 1-1½ turns open, (Super 8) ¾-1¼ turns open. Two screws—turning out gives richer mixture.
Idle Speed (standard)—6 MPH.
Idle Speed (Ultramatic Drive)—400 RPM.
Float Level—(WDO) 5/32", (WGD) 13/64" from top of float to cover with valve seated (inverted, gasket off).
Accelerating Pump (644SA only)—Inner Hole (minimum) Normal. Outer hole if more charge needed.

Choke Setting (643SA, 644SA): Centered (at index).

Choke Setting (728S & SA): One point lean.

Fuel Pump Pressure: 4-4¾ lbs.

MANIFOLD HEAT CONTROL: Automatic. No adjustment. Valve must operate freely.

VALVE TAPPET CLEARANCE: .007" Intake, .010" Exhaust, Hot.
Valve Timing Check—*See Valve Timing.*

STARTING: *See Battery, Starter, Generator, Regulator.*

IGNITION

AUTO-LITE

IGNITION SWITCH: Mitchellock Type 24.

COIL: Auto-Lite Model CE-4033.
Location—Left side of engine above distributor.
Ignition Current—2.75 amperes idling, 4.5 stopped.

CONDENSER: Auto-Lite Part No. IG-2671K.
Capacity—.20-.25 microfarad.

DISTRIBUTOR: Auto-Lite Model IGP-4502B. Automatic advance type with Vacuum Spark Control and Fuel Compensator Adjustment.
Breaker Gap—.017". Limits .013-.018".
Cam Angle—Closed 27°, Open 18°.
Breaker Arm Spring Tension—17-20 ounces.
Rotation—Counter-clockwise viewed from above.

Automatic Advance (Auto-Lite)

Degrees	Distr. R.P.M.	Degrees	Eng. R.P.M.
Start	300	0	600
1	400	2	800
3	600	6	1200
6	1200	12	2400
8	1600	16	3200

Fuel Compensator: 40° range of adjustment on quadrant at vacuum link connection. See Ignition Timing.

Vacuum Spark Control: Auto-Lite. Mounted on hold-down plate and linked to adjusting quadrant on distributor. Provides additional advance at speeds above idling except when engine accelerated or operated with wide open throttle when spark retarded by return spring.

Vacuum Advance (Auto-Lite)

Distr. Degrees	Eng. Degrees	Vacuum (" of HG)
Start	0°	6"
2°	4°	9⅜"
4°	8°	10½"
6°	12°	12⅞"
7°	14°	14"

Distributor Removal: On left side of engine. Disconnect vacuum line, take out hold-down plate screw, lift off.

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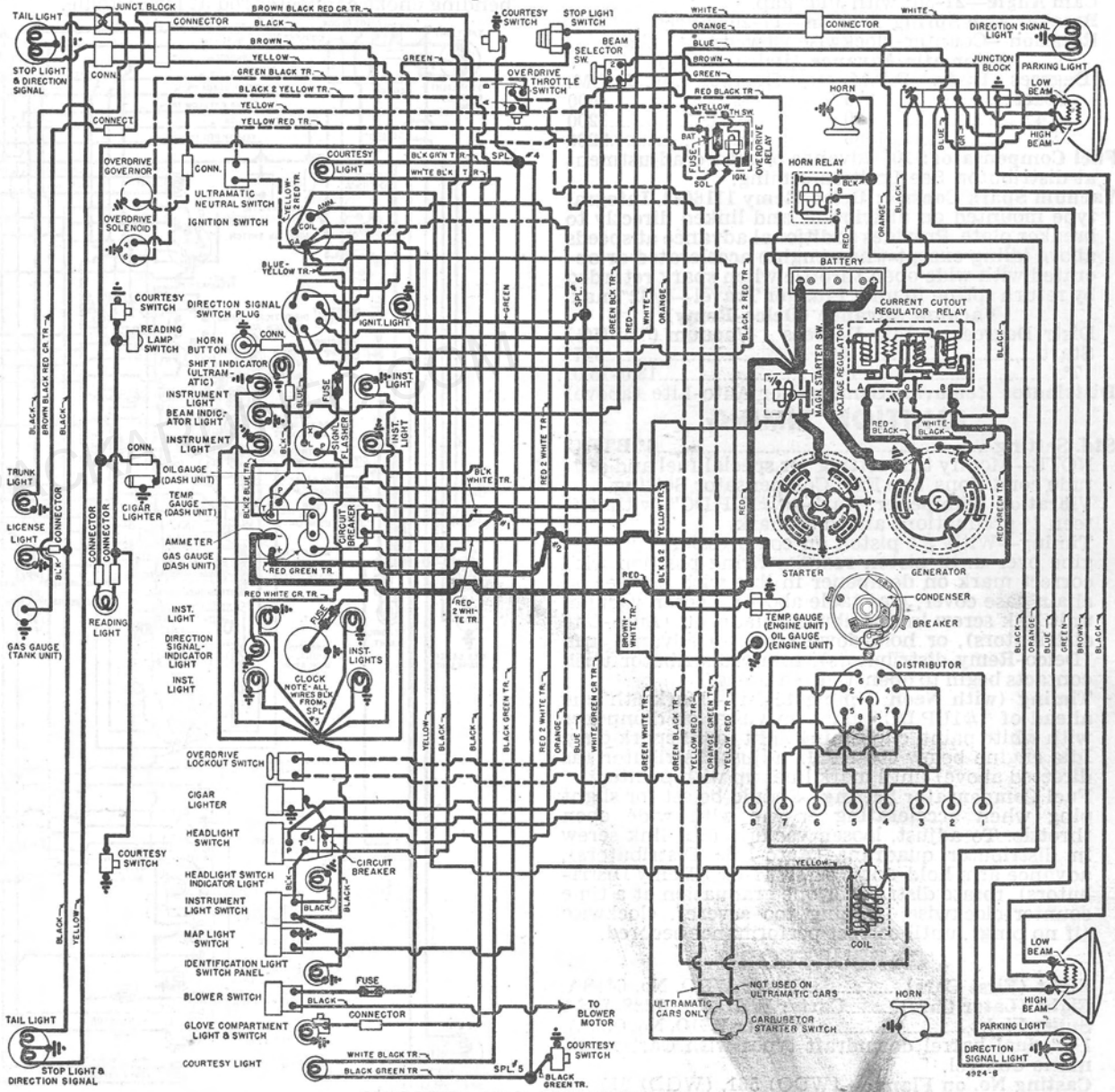


CARS WITH AUTO-LITE EQUIPMENT

CONTINUED FROM PRECEDING PAGE

IGNITION

DELCO-REMY

IGNITION SWITCH: Mitchellock Type 24.

COIL: Delco-Remy No. 1115376.
Location—Left side of engine above distributor.
Ignition Current—2.75 amperes idling, 4.5 stopped.

CONDENSER: Delco-Remy Part No. 1869704.
Capacity—.20-.25 microfarad.

DISTRIBUTOR: Delco-Remy Model 1110811. Automatic advance type with Vacuum Spark Control and Fuel Compensator.
Breaker Gap—.017". Limits .013-.018".
Cam Angle—21-30° with .017" gap.
Breaker Arm Spring Tension—17-20 ounces.
Rotation—Counter-clockwise viewed from above.

Automatic Advance (Delco-Remy)

Degrees Distr.	R.P.M.	Degrees Eng.	R.P.M.
Start	300	2	600
4	600	8	1200
9	1600	18	3200

Fuel Compensator: 10° advance or retard adjustment at distributor. See Ignition Timing.

Vacuum Spark Control: Delco-Remy 1116041. Integral type mounted on distributor and linked directly to breaker plate. Provides additional advance at speeds above idling except when engine accelerated or operated with wide open throttle when spark retarded by return spring in unit. Plunger Travel—5/32" max.

Vacuum Advance (Delco-Remy)

Distr. Degrees	Eng. Degrees	Vacuum (" of HG)
Start	0°	5-7"
7°	14°	13.0-15.0"

Distributor Removal: Same as for Auto-Lite (above)

IGNITION TIMING

Std. Setting ..... **6° BTDC.**
NOTE—Modify this setting for special fuel and altitude conditions. See Fuel Compensator Setting.
Vibration Dampener Mark—"#1UP.DC" with fifteen 1° graduations ahead of mark.
Timing—With #1 piston on compression, turn engine over until piston reaches firing position with correct mark on dampener in line with pointer on chain case cover, (see table above). Loosen vacuum unit link screw in distributor quadrant. (Auto-Lite distributors), or hold-down screw in advance arm (Delco-Remy distributors), rotate distributor until contacts begin to open, tighten screw.
Timing (with Neon Timing Light)—Mark 6th line ahead of "#1UP.DC" mark on vibration dampener with white paint, clip timing light to #1 spark plug. Idle engine below 600 RPM., adjust distributor (as directed above) until mark lines up with pointer.
Fuel Compensator Setting—Should be set for slight ping when accelerating engine with wide open throttle. To adjust, loosen vacuum unit link screw in distributor quadrant (Auto-Lite Distributors), advance arm hold-down screw (Delco-Remy Distributors), rotate distributor one graduation at a time counter-clockwise (if ping too severe), clockwise (if no ping), until correct performance secured.

CARBURETOR

Eight (First Cars).....**Carter WDO, No. 644SA.**
Eight (Later Cars).....**Carter WGD, No. 728S & SA**
Super Eight.....**Carter WDO, No. 643SA.**
1¼" dual barrel downdraft types with Carter Climatic Control.
Casting No. on Flange—(WDO) 561, (WGD) 615.
See Carburetor Section for complete data.

Settings (Idle Setting, Float Level, and Accelerating Pump): *See Tune-Up data.*
Metering Rods & Jets—*See Carter Jet Table in Carburetor Section.*

Fast Idle (WDO: Carter Dual (WDO) Carburetor.
See Carburetion Equipment Section for complete data.
Setting—.026" (643SA), .020" (644SA) throttle opening with choke valve closed. Adjust by turning fast idle screw on high step of fast idle cam.

Fast Idle (WGD): Carter Dual (WGD) Carburetor.
See Carburetion Equipment Section for complete data.
Setting—.026" throttle opening with choke valve closed (throttle must be opened first). Adjust by bending choke connector rod at lower angle.

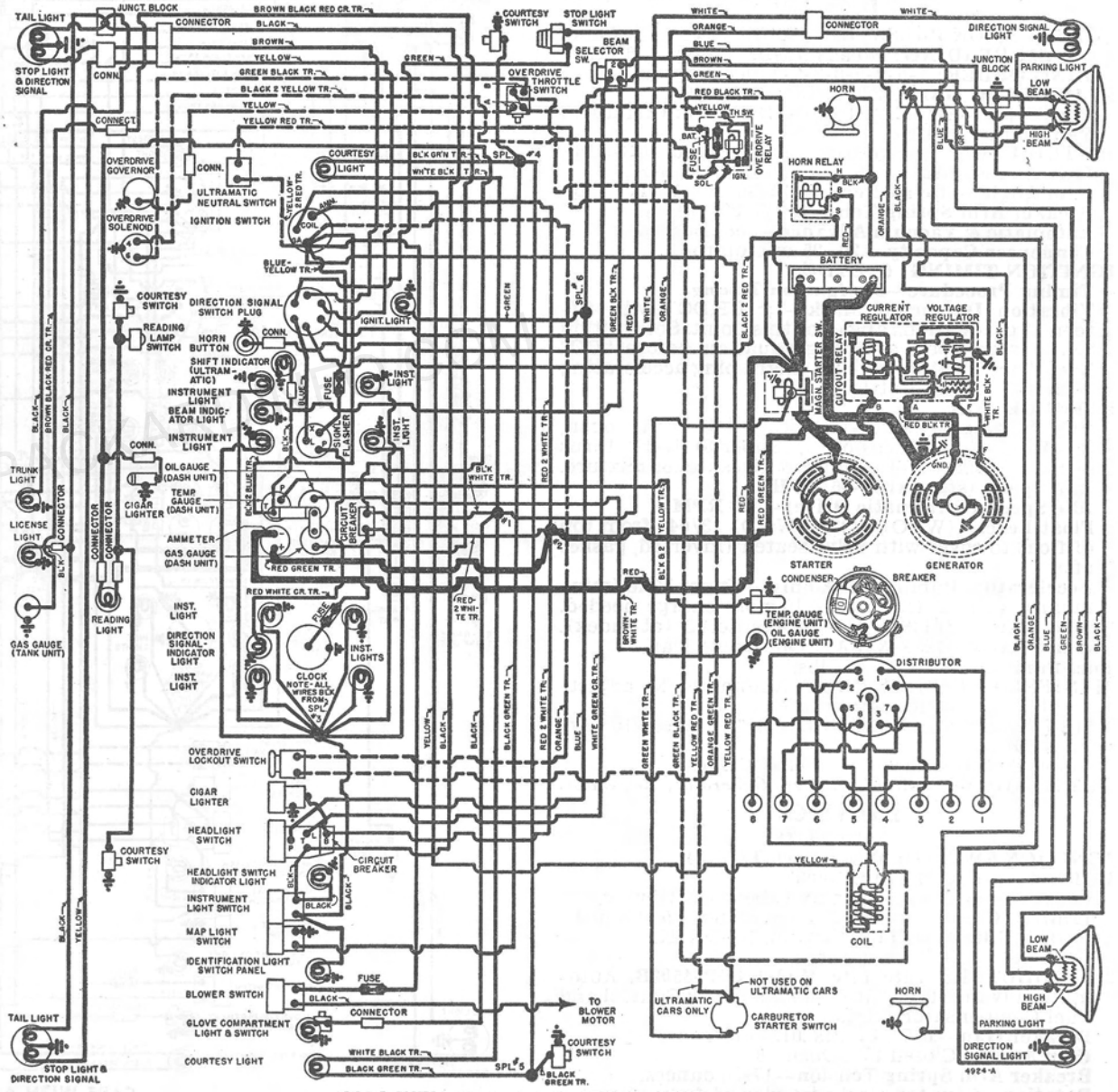
Automatic Choke: Carter Climatic Control (Dual Carburetors).
See Carburetion Equipment Section for complete data.
Setting—(WDO) Centered, (WGD) One Point Lean.

CARB. EQUIPMENT

Air Cleaner (std.—oil-wetted): AC No. 1544276 (Type #6 element).

Optl. (oil bath)—AC. 1544277 (Type #7-S element).

Servicing (oil-wetted type)—Wash and re-oil filter element every 1000 to 2000 miles whenever crankcase oil is changed.



CARS WITH DELCO-REMY EQUIPMENT

Servicing (oil bath type)—Clean filter element, clean and refill oil reservoir with SAE No. 50 engine oil (Summer), No. 30 (Winter) to level of indicator line on case (approx. 1 pint) every 5000 miles or oftener if required.

Fuel Pump (Fuel-&-Vacuum): AC Type AJ. No. 1523867.
Replacement Pump—AC No. 508.
Pressure—4-4¾ lbs.
See Carburetion Equipment Section for complete data.

Gasoline Gauge: King-Seeley Electric.
"2200" Series
Dash Unit—K-S No. 41635.
Tank Unit—K-S No. 41676 (Eight), 41678 (Super 8).
See Carburetion Equipment Section for complete data.

BATTERY

Auto-Lite Type PN-15ZR or Willard SW-1D-100. 6 volt, 15 plate, 100 amp. hr. capacity (20 hr. rate).
Starting Capacity—120 amperes (Auto-Lite), 122 amperes (Willard) for 20 minutes.
Zero Capacity—300 amperes for 3.3 minutes. Five second voltage—4.2 volts.
Grounded Terminal—Positive (+) to frame.
Dimensions—Length 19¼". Width 4". Hgt. 8 29/32".
Location—Left side in engine compartment.

STARTER

AUTO-LITE

Auto-Lite Model MCL-6003. Armature No. MCH-2021
Drive—Outboard Barrel Type Bendix No. A-1915.
Rotation—Counter-clockwise at commutator end.
Cranking Engine—175-225 amperes.
Brush Spring Tension—42-53 ozs. (new brushes).

Performance Data (Auto-Lite)

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	5300	5.5	65
8.0 "	Lock	2.0	410

Removal: On left front face of flywheel housing. To remove, take out flange mounting screws.

Starting Switch: Auto-Lite Model SS-4017 Magnetic Switch on starter controlled by Carter Car Starter No. 192-11U on carburetor (accelerator pedal control).
See Electrical Equipment Section for complete data.

►**Ultramatic Drive Starter Safety Switch**—Packard No. 421319. On left side of transmission case. Connected in starter control circuit so that starter operative only with lever in "N" Neutral or "P" Parking.

STARTER

DELCO-REMY

Delco-Remy Model 1107943. Armature No. 1910938.
Drive—Outboard Barrel Type Bendix No. A-1792.
Rotation—Counter-clockwise at commutator end.
Cranking Engine—175-225 amperes.
Brush Spring Tension—24-28 ozs. each.

Performance Data (Delco-Remy)

Torque	R.P.M.	Volts	Amperes
0 ft. lbs.	5500	5.7	65
16 "	Lock	3.0	600

Removal: Same as Auto-Lite data (above).

Starting Switch: Delco-Remy Model 1452 Magnetic Switch on starter controlled by Carter Car Starter No. 192-11U on carburetor (accelerator pedal control).
See Electrical Equipment Section for complete data.

►**Ultramatic Drive Starter Safety Switch**—Packard No. 421319. On left side of transmission case. Connected in starter control circuit so that starter operative only with lever in "N" Neutral or "P" Parking.

GENERATOR

AUTO-LITE

Early.....**Auto-Lite GDZ-4801T.** Arm. GDZ-2006F.
Later.....**Auto-Lite GGW-6001E.** Arm. GGW-2006F.
Convt......**Auto-Lite GGU-6001C.** Arm. GGU-2006F.
Two brush types with current and voltage regulation.
Maximum Charging Rate—See table below.
Charging Rate Adjustment—None. See Regulator.

Performance Data (Auto-Lite GDZ-4801T)

Amperes	Volts	Cold—R.P.M.—Hot
0	6.4	870-970 950-1050
35	8.0	1800-2000 2150-2350

Performance Data (Auto-Lite GGU-6001C)

45	8.0	1550 Max. ..... ———

Performance Data (Auto-Lite GGW-6001E)

0	6.4	870-970 950-1050
40	8.0	1800-2000 2150-2350

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—35-53 ozs. (new brushes).
Field Current—1.6-1.8 amperes at 6.0 volts.
Motoring Current—(GDZ) 4.2-4.6 amps., (GGU) 5.5-6.5 amps., (GGW) 4.6-5.2 amperes, all at 6.0 volts.

Removal: Pivot mounted at left front of engine To remove, take out strap screw and mounting bolts.

Belt Adjustment: ½" belt deflection between fan and generator. Loosen adjusting strap screw, pry the generator out for ½" setting, tighten screw.

GENERATOR

DELCO-REMY

"2200-9".....**Delco-Remy 1102705. Arm. No. 1879002**
"2300".....**Delco-Remy 1102715. Arm. No. 1912599**
Two brush types with current and voltage regulation.
Maximum Charging Rate—See tables below.
Charging Rate Adjustment—None. See Regulator.

Performance Data (Delco-Remy)

	Amperes	Volts	R.P.M.
1102705 (Cold)	30	8.0	1750
1102715 (Cold)	40	8.0	1900

Rotation—Counter-clockwise at commutator end.
Brush Spring Tension—25 ounces each.
Field Current—(1102705) 1.75-1.9 amps. at 6.0 volts. (1102715) 1.90-2.05 amperes at 6.0 volts.

Removal & Belt Adjustment: See Auto-Lite above.

REGULATOR

AUTO-LITE

Auto-Lite VAV-4401B.....for GGU-6001C Generator
Auto-Lite VRP-4402A.....for GDZ-4801T Generator
Auto-Lite VRP-4402C.....for GGW-6001E Generator
All are current-voltage types.
See Electrical Equipment Section for complete data.
NOTE—Regulator cover sealed. Warranty void if seals broken.

Cutout Relay
Cuts In—6.4-7.0 volts, (set to 6.4-6.6 volts).
Cuts Out—4.1-4.8 volts (approx. 4-6 amps. disch.).
Contact Gap—.015" minimum.
Air Gap—.031-.034" with contacts open (check at hinge end of core).

Voltage Regulator
Setting—7.2-7.5 volts at 70°F. See Electrical Equipment Section for settings at other temperatures.
Checking (without breaking seals) & Adjustment—***See Electrical Equipment Section for complete data.***
Contact Gap—.012" min. (armature against stop pin).
Air Gap—.048-.052" with contacts just opening.

Current Regulator
Setting—As follows:
VAV-4401B 44-46 amperes (marked '45' on cover).
VRP-4402A 34-36 amperes (marked '35' on cover).
VRP-4402C 39-41 amperes (marked '40' on cover).
Checking (without breaking seals) & Adjustment—***See Electrical Equipment Section for complete data.***
Contact Gap—.012" min. (armature against stop pin).
Air Gap—.048-.052" with contacts just opening.

REGULATOR

DELCO-REMY

Delco-Remy 1118331.....for 1102705 Generator
Delco-Remy 1118360.....for 1102715 Generator

►***NEW "1118300 SERIES"*** regulators have screw adjustment for settings and single regulator springs.
See Electrical Equipment Section for complete data.
CAUTION—Check generator for grounded field coils and leads before changing regulator settings to correct High Charging Rate or High Voltage.

Cutout Relay
Cuts In—5.9-6.8 volts hot (set to 6.4 volts hot).
Contact Gap—.020" (same for both sets).
Air Gap—.020" (with contacts just closed).

Voltage Regulator
Setting—7.0-7.7 volts hot (set to 7.4 volts hot). Regulator is over-compensated for temperature. Should be checked with cover in place and hot.
Air Gap—.075" with armature pressed down to point where contacts are just touching.
Checking & Adjustment—***See Electrical Equipment Section.***

Current Regulator
Setting—As follows:
1118331.....32-40 amperes hot (set to 36 hot)
1118360.....40-46 amperes hot (set to 42 hot)
Air Gap—.075" with armature pressed down to point where contacts are just touching.
Checking & Adjustment—***See Electrical Equipment Section.***

LIGHTING

Headlamps: Hall "Sealed Beam" type.
See Electrical Equipment Section for complete data.
Adjustment—Aim upper beams straight ahead (hot spot center 3" below lamp center height at 25 ft.).
Beam Indicator—Light at top of speedomter dial. Lighted when Upper Beams "on".

Direction Signal: Std. ***See Electrical Equipment Section.***
Direction Signal Indicator—Light at top of clock. Flashes when Signal in use.

MISC. ELECTRICAL

CIRCUIT BREAKERS: Vibrating, thermostatic types.
Lighting—30 ampere. On lighting switch.
Accessory (Stop & Body Lamps)—30 ampere. Behind instrument panel below gauges. Protects Glove Box Lamp, Courtesy Lamps, Map Lamp, Stop Lamps, Dome Lamp, and Rear Cigar Lighter.
Hydro-Lectric Power (Convertible)—On engine side of dash on pump upper bracket.

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FUSES: Clock—SFE 3 ampere in lead below Clock.
Direction Signal—SFE 9 ampere. In Flasher feed wire above Ash Tray.
Overdrive—SFE 30 ampere. On Overdrive Relay (at BAT terminal) on engine side of dash.
Electromatic Clutch—9 ampere. In lead from Ignition Switch to Electromatic Clutch Switch.
Heater—SFE 30 ampere. In cable near Ign. Switch.

HORNS: Sparton. Dual horns operated by relay.
Horn Current—22-25 amperes.

Horn Relay: Delco-Remy No. 1116775.
Contacts Close—2.75-4.0 volts (set to 3.5 volts).
Contact Gap—.027". **Air Gap** .014" (contacts closed).

ENGINE

ENGINE SPECIFICATIONS: 8 cylinder, "L" head type.

	Eight	Super 8
Bore	3½"①	3½"①
Stroke	3¾"	4¼"
Displacement	288 cu. ins.	327 cu. ins.
Rated HP.	39.2	39.2
Developed HP.	135 at 3600	150 at 3600

Compression Ratio—7.0-1 std. cast iron head.
Compression & Vacuum Reading—*See Tune-Up data.*
①—*For Original Bore Sizes, see Packard Special Data.*
►*.020" OVERSIZE BORE ENGINES: Marked by star following engine number.*

OIL PAN REMOVAL: *See Packard Special Data.*

TIGHTENING TORQUES: *See Packard Special Data.*

CYLINDER HEAD: Tightening Torque & Cylinder Head Diagram—*See Packard Special Data.*

PISTONS: Aluminum alloy, autothermic strut type. *Original Piston Sizes & Markings, See Packard Special Data.*
Length—3⅞".
Weight—19½ ozs. (stripped), 25½ (with rings & pin)
►**Cyl. Bore Taper Note**—Car manufacturer recommends cylinders be re-bored and new pistons installed if cylinder taper exceeds .007-.010". If necessary, new rings only can be installed (without reboring) for taper up to .014".
Removal—Pistons and rods removed from above.
Clearance—.0005-.001". See Fitting New Pistons.
►**Piston Skirt Expander Note**—Car manufacturer recommends skirt expanders be installed if cylinder diameter over .006" greater than piston skirt diameter (measured alongside upper end of piston skirt slot).

Replacement Pistons: *See Packard Special Data.*
NOTE—Check ring grooves for wear by installing new piston ring in groove—if .006" feeler can be inserted 1/16", wear excessive and piston should be replaced. Check top groove when testing.

Fitting New Pistons: Insert .0015" feeler ½" wide between piston and cylinder wall on side opposite slot. Pull to withdraw feeler should be 12-18 lbs.
NOTE—Piston should hold in any portion of bore of own weight, but should move when one or two finger pressure applied to piston with cyl. bore vertical.

Install Pistons: Slot toward camshaft.

PISTON RINGS: Two compression rings (No. 200 top groove, No. 200 second groove), one oil control ring (No. 85) per piston, all above pin. Oil ring groove has twelve 5/32" oil drain holes.

Ring	Width	End Gap	Side Clearance
Comp. (#1, 2)	.0930-.0935"	.0054-.0233"	.0025-.003"
Oil (#3)	.186-.1865"	.0054-.0213"	.0025-.003"

Installing Rings—End gaps must be between pin holes with #2 ring on same side as skirt slot, #1 and #3 ring on side opposite slot.

Replacement Rings: Std., .020", .030", .040" oversize.

PISTON PIN Diameter—7/8". **Length**—3 1/64".
Floating type retained by lock ring at each end. Split type bushing used in upper end of rod.
Pin Fit in Piston—Palm push fit with piston at 160°F. (heat piston in water only).
Pin Fit in Rod Bushing—Finger push fit at 70°F.
Piston Pin (Connecting Rod) Bushing Installation—*See "Piston Pins" in Packard Special Data.*

Replacement Pins: Std. and .003", .006" oversize.

CONNECTING ROD: Length 7 15/16" (8), 7 11/16" (Super 8).
Weight—35.8 ozs. (Eight), 35.4 ozs. (Super 8).
Crankpin Journal Diameter—2.250".
Lower Bearing—Shimless, precision, steel backed, Moraine Durex or Federal Mogul H-24.
Clearance—.0005-.0025". **Endplay**—.003-.011".
NOTE—Plastigage can be used for checking bearing clearance. See "Crankshaft & Main Bearings" in Packard Special Data.

Bearing Adjustment: None (no shims). Replace bearings. Self-locking nuts used on cap bolts (tighten to 60-65 ft. lbs.).

Replacement Bearings: Std., .001", .002", .020" US.

Installing Rods: Oil squirt hole toward camshaft.

CRANKSHAFT: 5 bearing type with integral counterweights.
Vibration Dampener—Houde with Silicone fluid (8), Rubber Friction Disc (Super 8).
Dampener Removal Note—Use a Puller Tool No. J-2582 for Friction Disc Dampeners, or J-2636 for Fluid type Dampeners.
Journal Diameter—2.7465".
Bearings—Interchangeable, shimless, precision, steel-backed Moraine Durex or Federal Mogul H-24.
Clearance—.001-.003".
NOTE—Plastigage can be used for checking bearing clearance. See "Crankshaft & Main Bearings" in Packard Special Data.

Bearing Adjustment: None (no shims). Replace bearings (upper halves can be rotated in and out).

Replacement Bearings: Std., .001", .002", .020" US.

Crankshaft Front Oil Seal: *See "Crankshaft & Main Bearings" in Packard Special Data.*

End Thrust: At #3 bearing. **Endplay**—.0035-.0085".

CAMSHAFT: 5 bearing. Non-adjustable chain drive.
Bearings—Steel-backed, babbitt-lined bushings.
Clearance—.001-.003".

End Thrust: Taken by thrust plate in back of camshaft sprocket. **Endplay**—.004-.006".

Timing Chain: Morse. Width 1¼". Pitch .375". Length 21¾" or 58 links.

Camshaft Setting: Install chain and sprockets together with "0" marks on sprockets adjacent and in line with straightedge across shaft centers.

VALVES:	Head Diameter	Stem Diameter	Length
Intake	1 43/64"	.3417"	5 7/8"
Exhaust	1 7/16"	.3398"	5 7/8"

	Seat Angle	Lift	Stem Clearance
Intake	30°	.342"	.002"
Exhaust	45°	.342"	.004"

Valve Guides: Lubrite coated. Pressed in block from above with upper end 31/32" below top of block. Use Valve Guide Driver and Depth Gauge No. J-2577—properly positions guides when gauge seats on block. Ream guides after installation with 11/32" (.3437") reamer. Upper end of exhaust guide counterbored.
Valve Guide Removal Note—If guides to be removed with tappets in engine, use Valve Guide Remover Tool J-2580 to drive guide down to just clear tappet (with tappet on heel of cam). Score guide with chisel inserted through valve ports, then break off lower end, finally drive remainder of guide out. If tappets out, guide can be driven down and out without breaking.

Valve Springs: Intake and exhaust springs interchangeable. Anti-rotation serrated cup washers installed on top of spring and seats in recess in block.

	Spring Pressure	Spring Length
Valve Closed	60-66 lbs.	1 3/4"
Valve Open	135-145 lbs.	1 13/32"

Valve Lifters: Mushroom type. Remove from below.
Diameter—.6235-.6240". **Clearance**—.0003-.0012".
Replacement Lifters—.001", .002", .005" oversize. Use Tool S.T. 5144 (piloted in valve guide) and ream for .005" oversize lifters.

VALVE TIMING

Tappet Clearance: .007" Intake, .010" Exhaust, Hot.

Valve Timing: See Camshaft setting above.
Intake Valves—Open 15° BTDC .Close 45° ALDC.
Exhaust Valves—Open 50° BLDC. Close 9° ATDC.
Above figures for .01267" Intake, .015" Exhaust tappet clearance.
Valve Timing Check—With .01267" tappet clearance #1 intake valve should open with #1 piston 10° BTDC. with 10th graduation before top dead center mark "1UP.DC" on vibration dampener aligned with pointer. Reset tappet clearance .007" Hot.
CAUTION—If valve over 8° before or after this point in opening, camshaft setting incorrect.

LUBRICATION

Engine Oiling System: Pressure to main and connecting rod bearings, camshaft bearings, piston pins, valve lifters, and timing chain.
Crankcase Capacity—7 quarts.
Normal Oil Pressure—40 lbs. Normal Driving.
Oil Pressure Regulator—On oil pump cover. Not adjustable. Pressure regulator spring tension should be 14 lbs. ±2 ozs. at 1⅞".

Oil Pump: Gear Type. On right side of crankcase.
Oil Pump Installation—*See Packard Special Data.*

Oil Filter: Optl. Replace cartridge at 8000-10000 miles or when oil shows signs of being dirty.

Oil Pressure Gauge: King-Seeley Electric.
"2200" Series
Dash Unit—K-S No. 41640.
Engine Unit—K-S No. 40767.
See Miscellaneous Section for complete data.

Crankcase Ventilation: Oil-wetted type filter element in oil filler cap air intake). Outlet pipe in valve compartment cover at rear.

COOLING

Cooling System: Pressure type with pressure relief valve in filler cap and fan belt driven pump.
Capacity—18 qts. (Eight), 19 qts. (Super 8), with ½ quart additional for heater and defroster.
Pressure Valve—AC 850005 Filler Cap. Opens 7 lbs.

Water Pump: Centrifugal, belt-driven, packless type.
See Water Pump Section for complete data.
Belt Adjustment—*See Generator Belt Adjustment.*

Thermostat: In cylinder head outlet.
Setting (std.)—Starts to open 148-150°F.
Setting (Optl. High Reading)—Starts to open 157-165°F. or 175-184°F.

Temperature Gauge: King-Seeley Electric.
"2200" Series
Dash Unit—K-S No. 41645.
Engine Unit—K-S No. 41085.
See Miscellaneous Section for complete data.

CLUTCH

Long (Eight) 10CF-T1, (Super Eight) 11CF-10½T1. Single plate, semi-centrifugal, dry disc type.
See Clutch Section for complete data.
Facings—Woven (U.S. Asbestos). Thickness .125". Inside Diameter (Eight) 6¾", (Super Eight) 7". Outside Diameter (Eight) 10", (Super Eight) 10½".

Pedal Adjustment: 1¼-1⅜" free travel. Adjusting nut on rod at throwout lever.

►**Clutch Pedal Over-Center Spring:** New adjustable type. *See "Clutch Notes" in Packard Special Data for adjustment.*

Removal: Remove transmission (see Transmission Removal following) and flywheel housing lower cover. Disconnect throwout linkage and remove throwout bearing. Remove clutch cover screws (release tension evenly), lower assembly out of car.

ELECTROMATIC CLUTCH

Electromatic Clutch: Vacuum type clutch actuation with electrical control. Optional equipment.
See Clutch Section for complete data.

TRANSMISSION

Own Make. Helical gear, constant-mesh, synchro-mesh (Second & High), constant-mesh (Low). Sliding spur gear (Reverse). Low & Second speed gears are ball bearing mounted.
See Transmission Section for complete data.

Transmission Control: Steering column type.
See Transmission Section for complete data.

Removal: Disconnect shifter rods, speedometer cable, hand brake cable at equalizer, engine ground strap, front universal (block driveshaft up against floor pan). Support rear of engine with jack and unbolt cross-member (at frame ends and transmission). Disconnect clutch retractor spring and fore-and-aft restraint rod. Take out transmission-to-housing mounting screws, remove transmission.

OVERDRIVE

Warner Model (Eight) AS3-R11, (Super Eight) AS4-R11. Optl. equipment used with Packard transmission. New simplified solenoid operated overdrive with Governor Control and throttle operated "kick-down".

►**Series 2200 Note**—Started part production with Engine Serial No. G-272006 (Eight), G-424978 (Super 8). Started full production with Engine Serial No. G-285157 (Eight), G-427710 (Super Eight).
See Transmission Section for complete data.

►**Early R11 Overdrive Failure to Engage Correction**—*See "Warner R11 Overdrive" in Transmission Section.*

Overdrive Solenoid—Packard No. 403942.
Governor—Packard No. 418447.
Control Relay—Packard No. 403940.
Kick-down Switch—Packard No. 403945.
Lock-out Switch—Packard No. 354820.

Removal: Disconnect control cable and all leads to solenoid and governor. Free mounting at rear of overdrive case. Then remove overdrive and transmission (see Transmission Removal above).

ULTRAMATIC DRIVE

OPTIONAL EQUIPMENT

Own Make. Torque Converter (with hydraulically operated Direct Speed Clutch) and hydraulically operated planetary unit with manual control.
See Transmission Section for complete data.

Linkage Adjustment on Ultramatic Drive Cars: *See Packard "Ultramatic Drive" in Transmission Section.*

Lubrication—Check fluid level every 1000 miles, drain and refill every 10,000 miles.
Recommended Fluid. Packard Ultramatic Drive or any Type "A" Automatic Transmission Fluid which has an AQ-ATF number embossed on container.
Capacity. Approximately 12 quarts.
Draining & Refilling. *See Packard "Ultramatic Drive" in Transmission Section.*
Checking Fluid Level. *CAUTION—Fluid must only be checked at normal operating temperatures and after engine has been idling at 800 RPM. for at least one minute with selector lever in "N" position.* Stop the engine, check level by removing dipstick from filler hole on left side of transmission (accessible from under car—release cap by turning ½ turn counter-clockwise). Add fluid as required to bring level up to FULL mark on dipstick.

Removal: *See "Packard Ultramatic Drive" in Transmission Section.*

UNIVERSALS

Mechanics 3CR or Spicer. Needle bearing types.
2301 Model (without Overdrive)—Use Spicer Number 1288-5101X u-joints front and rear.
NOTE—Cars without Overdrive use one-piece shaft.
See Universals Section for complete data.

►*CAUTION*—Rear universal flange nut controls rear axle pinion bearing pre-load which **must be adjusted whenever nut is loosened.** *See "Packard Rear Axle" in Rear Axle Section for complete data.*

REAR AXLE

Own Make. Semi-floating, hypoid gear type with Hotchkiss Drive.
Model 2222-9 & 2322 (141" WB. 7-Pass. Sedan) Note—Axle is Custom 8 type with Ring Gear Idler Roller.
See Rear Axle Section for complete data.
Ratio—Std.: 3.9-1 (39-10). OD.: 4.1-1 (41-10).
2222-9 & 2322 NOTE—Std. Ratio 4.09-1 (45-11).
Backlash—.003-.005". Screw adjustment.

Removal: Remove axle shafts (see Removal below). Disconnect rear universal (wire trunnions), wire or prop propeller shaft up against floor pan with 2 x 4 inserted inside frame X-member. Drain differential, replace drain plug. Clean off housing, take off carrier lock nuts, lift carrier out.

Axle Shaft Removal: Remove wheel, brake drum (use screw type puller J-4153—do not use knock-out type puller or thrust block may be damaged). Disconnect brake line at wheel cylinder. Remove nuts at oil seal guard and take off seal guard, gasket, retainer, oil seal, brake support plate, and bearing shims. Remove axle shaft and bearing using Puller J-2552 (do not drag shaft on inner oil seal). Use Tool J-943-B to remove inner oil seal.

Wheel Bearing Adjustment: Endplay controlled by shims between flanged end of housing and brake backing plate. Add or remove shims (furnished .005", .007", .020" thick) at one wheel for .050" or under, at both wheels if over .050" to secure .004-.007" endplay.
Endplay—.004-.007".

SHOCK ABSORBERS

Delco Model 1946-J, K (front), Delco or Monroe (rear). Double acting (front), direct acting (rear).
See Shock Absorber Section for complete data.

Fifth Shock Absorber (Stabilizer) Super 8: Monroe direct acting, hydraulic (built-in rear stabilizer).
See Shock Absorber Section for complete data.

FRONT SUSPENSION

Front Suspension: Packard Clipper Safe-T-Flex, independent, linked parallelogram type with coil springs and double acting shock absorbers.
See Front Suspension Section for complete data.

Kingpin Inclination—5°50′ crosswise.

Caster—Neg. 1° ± ½°. Eccentric adjustment.
Model 2222-9 & 2322: Neg. 2° ± ½°.

Camber—0° ± ¼°. Eccentric adjustment.

Toe In—0" (plus 1/16", minus 0"). Adjust by turning adjuster at outer end of each tie rod equally.

STEERING GEAR

Packard—Gemmer Model 335. "3-tooth" Worm-and-Roller with "push-pull" adjustment. See Gemmer
See Steering Gear Section for complete data.

BRAKES

Service: Bendix Hydraulic, Duo-Servo, Single Anchor type without eccentric adjustment. Hand lever applies rear wheel service brakes.
See Brake Section for complete data.

Wheel Cylinder—Diam. Front 1 1/16" (1" 7-Pass.), Rear wheels 15/16".

Drums—12" centrifuse type.

Lining—Marshall 4112 (primary shoe), Marshall 9051 (secondary). Width 1 3/4". Thickness 3/16". Length per shoe 11½" (primary), 13" (secondary).
Model 2222-9 & 2322 7-Pass. Note—Lining width 2¼" front wheel shoes, 2" rear wheel shoes.

Clearance—.015" at both ends of secondary shoe with primary shoe forced out against drum.

Hand Brake: See Service Brakes above.

MISC. MECHANICAL

Power Operated Convertible Tops, Windows & Front Seat: Hydro-Lectric type (hydraulic actuation with motor-driven pump supplying oil under pressure for power cylinders).
See Miscellaneous Section for complete data.

Windshield Wiper: Vacuum type, cable operated.
See Miscellaneous Section for complete data.